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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,654	08/07/2003	Neil Clarke	124613MG	1653

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EXAMINER

MAI, ANH T

ART UNIT	PAPER NUMBER
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2832

DATE MAILED: 08/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

14A

Office Action Summary

Application No.

10/604,654

Applicant(s)

CLARKE ET AL.

Examiner

Anh T. Mai

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5,17,19,24 and 25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5,17,19,24 and 25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/14/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 5 are rejected under 35 U.S.C. 102(e) as being anticipated by Emeric et al. [6909283].

Emeric discloses: an RF coil 56; cylindrical patient bore enclosure where a plurality of cooling tubes 76 attached, which are circular around imaging volume 72 [col 6, lines 63-67]; means for directing air through cooling tubes to cool RF coil [figure 2].

As is well known, circulating a liquid having a temperature less than the temperature of the surrounding environment may result in condensation forming in the resulting environment. That is, circulating coolant through tubes 76 to dissipate heat from the gradient coils in a non-vacuous chamber could result in condensation forming on the surface of the gradient coils if the coolant temperature is below the dew point in the chamber

Further enclosed in vacuum chamber 74 are a number of cooling tubes 76 configured to circulate liquid coolant, such as water only, or a water-ethylene-glycol mixture or a water-propylene-glycol mixture, to remove heat generated by the excitation of the gradient coils. When generating the magnetic field gradients, the gradient coils, as a result of the resistive effects of their copper composition, generate considerable heat, typically on the order of tens of kilowatts, which must be dissipated to ensure proper operation of the MRI system 10. To assist in heat dissipation, coolant is circulated through the cooling tubes 76 embedded in resonance module 74, as will be discussed shortly.

The gradient coil assembly 50 forms part of a magnet assembly 52 which includes a polarizing magnet 54 and a whole-body RF coil 56. A transceiver module 58 in the system control 32

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produces pulses which are amplified by an RF amplifier 60 and coupled to the RF coil 56 by a transmit/receive switch 62. The resulting signals emitted by the excited nuclei in the patient may be sensed by the same RF coil 56 and coupled through the transmit/receive switch 62 to a preamplifier 64. The amplified MR signals are demodulated, filtered, and digitized in the receiver section of the transceiver 58. The transmit/receive switch 62 is controlled by a signal from the pulse generator module 38 to electrically connect the RF amplifier 60 to the coil 56 during the transmit mode and to connect the preamplifier 64 to the coil 56 during the receive mode. The transmit/receive switch 62 can also enable a separate RF coil (for example, a surface coil) to be used in either the transmit or receive mode.

3. Claims 17, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Dean et al. [US 2002/0073717A1].

Dean discloses an RF coil 152 of hollow cylindrical positioned inside gradient coils 139, 140; apparatus for cooling the coil; a patient bore enclosure 32 inside RF coil which has cooling tubes 56, 58 attached to exterior of the enclosure by RF coil; a pump 24 and heat exchanger 22; a computer system 200 electronically linked to coolant pump and temperature sensors [figures 1-8].

The cooling tube may either be in contact with wall 32 or may be embedded within the wall and the pattern of cooling tubes associated with wall 32 may take many different forms (i.e., linear along the length of wall 32, spirally around the wall 32, having tubes on the inside or the outside of wall 32, etc.). To this end, referring to FIGS. 6-8, a block representing a heat generating system component that may reside inside RF space 40 is illustrated and identified by numerals 20 (i.e., the table) 152 (i.e., the RF coil) and 32 (i.e., the wall). In FIG. 6 the table 56-58 is proximate the block, in FIG. 7 tube 56, 58 is in contact with the block and in FIG. 8 the tube 56-58 is partially embedded within the block.

As illustrated a series of hermetically sealed conduits or tubes collectively referred to by numeral 50 are interspersed within each of the gradient coils 139 and 140. Each tube is linked to pump 24 and heat rejecter 22 via inlet and outlet conduits 52, 54, respectively, to form a closed circuit from rejecter 22 through pump 24 to the coils and back again to the rejecter 22. In this manner cooling liquid can be provided to the field generating system components that reside outside the RF space 40.

As well known in the MRI industry, high power MRI systems consume large amounts of electrical power. In particular, the gradient and RF coils consume excessive amounts of power and thus these coils generate significant heat. As one would expect, excessive heat can cause system components to deteriorate or fail prematurely and hence adversely affects reliability. In addition, heat can be an annoyance to a patient during the imaging process and, if excessive, could injure a patient. For this reason there

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are regulations that stipulate the maximum temperature of a patient support table that effectively limit the amount of power that can be used in any MRI system.

Referring now to FIG. 4, while rejecter 22 and pump 24 may be linked separately to each component within the RF space 40, it is also contemplated that components to be cooled within space 40 could be linked in series. In addition, it is contemplated that components within RF space 40 and that reside outside space 40 that have to be cooled could be linked in series with a second portion of the conduit outside the RF space. For example, gradient coils 139 and 140 and RF coils 152 in FIG. 1 could be linked in series with pump 24 and heat rejecter 22. Moreover referring also to FIG. 1, any system components illustrated in FIG. 1 that need to dissipate heat could be linked in series or separately to rejecter 22 and pump 24. For example, RF electronics inside pulse generator module 121 could be linked to rejecter 22 and pump 24 for cooling purposes. Referring again to FIG. 4, an exemplary series linkage of system components is illustrated and includes table 20, RF coil 152, RF electronics (e.g., 121), a block 60 indicating any other components that need to dissipate heat and heat rejecter 22.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 19, 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean in view of Emeric.

Dean discloses an RF coil 152 of hollow cylindrical positioned inside gradient coils 139, 140; apparatus for cooling the coil; a patient bore enclosure 32 inside RF coil which has cooling tubes 56, 58 attached to exterior of the enclosure by RF coil 152; a pump 24 and heat exchanger 22; a computer system 200 electronically linked to coolant pump and temperature sensors [figures 1-8]. Dean discloses the claimed invention except for the cooling tubes in helical configuration. Emeric discloses cylindrical patient bore enclosure where a plurality of cooling tubes 76 being circular around imaging volume 72 [col 6, lines 63-67]. At the time of the

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invention, it would have been obvious to a person of ordinary skill in the art to use cooling tube in helical shape as taught by Emeric to Dean. The motivation would have been to increase the heat exchange of the coils. Therefore, it would have been obvious to combine Emeric with Dean.

With respect to claim 25, Dean disclose only one cooling tube embedded to the RF coil. Emeric disclose a plurality of cooling tubes 76 embedded in resonance module as seen in figure 2 to increase the cooling volume of the coil. Therefore, it would have been obvious to combine Emeric with Dean.

Response to Arguments

6. Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

7. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., air-cooled patient bore such as shown in figures 4-7 and embodiment depicted in figures 4 and 5 of the application) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh T. Mai whose telephone number is 571-272-1995. The examiner can normally be reached on 5/4/9 Schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Elvin Enad can be reached on 571-272-1990. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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ANH MAI
PRIMARY EXAMINER